Remarks

Claims 22-36, 38, 39, and 44 were pending in the subject application. By this Amendment, claims 22 and 36 have been amended. No new matter has been introduced. Support for the amendments to the claims can be found throughout the original specification. Accordingly, claims 22-36, 38, 39, and 44 are before the Examiner for further consideration.

The amendments to the claims have been made in an effort to lend greater clarity to the claimed subject matter and to expedite prosecution. The amendments should not be taken to indicate the applicants' agreement with, or acquiescence to, the rejection of record. Favorable consideration of the claims now presented, in view of the remarks and amendments set forth herein is earnestly solicited.

Claims 22-26, 34-36, 38, 39, and 44 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Bakajin *et al.* (U.S. Patent No. 7,290,667) in view of Bailey *et al.* (U.S. Patent No. 5,569,501) and Tipler *et al.* (U.S. Patent No. 6,652,625). The applicants respectfully traverse this ground for rejection because the combination of cited references does not teach or suggest the claimed invention.

The claimed invention is drawn to a miniaturized gas chromatograph comprising a miniaturized separation column and a miniaturized device for the storage and enrichment of molecules or atoms, or both, as well as a process for the production of such a miniaturized gas chromatograph. The outlet of the chamber of the miniaturized device for the storage and enrichment is connected to the miniaturized separation column, providing a configuration in which the miniaturized separation column is located downstream from the miniaturized device for the storage and enrichment.

The Action states at pages 3 and 8 that Bakajin *et al.* disclose a miniaturized gas chromatograph comprising a miniaturized separation column and a miniaturized device for the storage and/or enrichment of molecules, atoms, or both, as well as a process for the production of such a miniaturized gas chromatograph. The applicants respectfully disagree.

Bakajin *et al.* disclose a microfluidic sieve in the form of a microfluidic channel in a substrate, wherein carbon nanotubes are grown in the channel. Bakajin *et al.* teach that the

microfluidic channel provides the function(s) of separation, concentration, and/or filtering. The entire disclosure of Bakajin *et al.* is directed to the microfluidic channel, and it is apparent that the channel serves to provide those functions which are required to later analyze the substances included in a gas stream using a detector only. Thus, Bakajin *et al.* fail to disclose a miniaturized separation column, let alone one arranged downstream of a miniaturized device for storage and enrichment, as in the claimed invention. Rather the microfluidic sieve in Bakajin *et al.* fulfills the function of a channel itself.

The applicants submit that, in the Bakajin *et al.* device, analysis would only be possible if molecules are concentrated in such a way that molecules of identical molecular weight are concentrated and separated such that molecules having different molecular weight are separated from each other. Usually, this separation results in a spreading of the molecules within the gas stream which is the basic function of a separation column. Thus, the microfluidic sieve according to Bakajin *et al.* does not comprise both a miniaturized separation column and a miniaturized device for the storage and enrichment of molecules and/or atoms. The function of the Bakajin *et al.* device is closer to that of a separation column, but in any event, there is no disclosure in Bakajin *et al.* of a miniaturized device for the storage and enrichment of molecules and/or atoms, let alone such a device connected to a miniaturized separation column.

Moreover, the applicants submit that a skilled artisan would not have been motivated to modify the device of Bakajin *et al.*, even in view of Bailey *et al.* and Tipler *et al.* to include any aspect of the claimed invention missing therefrom. Bakajin *et al.* teach that the disclosed microfluidic channel can provide the functions of separation, concentration, and filtering. Therefore, one of ordinary skill in the art would not have had a reason to add either a separate enrichment device or separation column. Without the benefit of the hindsight gleaned from the applicants' own disclosure, such an addition would have seemed duplicative and wasteful while unnecessarily increasing the cost of the overall device. Hindsight reconstruction of the prior art cannot support a §103 rejection, as was specifically recognized by the CCPA in *In re Sponnoble*, 56CCPA 823, 160 USPQ 237, 243 (1969).

The subject invention is based largely on the surprising discovery by the present inventors that the combination of a miniaturized storage and enrichment device with a downstream miniaturized separation column allows for the analysis of gas streams with very low molecular concentrations therein without the need for increasing the length of the separation column to such an extent that other problems occur (e.g., high pressure gradients to overcome the flow resistance). Before the claimed invention, it was not possible to separate and concentrate molecules, of a gas stream directed through a separation column and having a low concentration of molecules of different molecular weights, in the order of their molecular weights to such a degree that they could be accurately detected thereafter. Such a task would have required an extremely long separation column which could not be manufactured in a miniaturized system and which would theoretically induce such a high flow resistance that other adverse effects would occur. The claimed invention, including a miniaturized device for storage and enrichment as claimed and provided upstream from a miniaturized separation column, solved this problem which existed in the art.

This advantageous arrangement is not taught or suggested in the combination of cited references. For example, Bakajin *et al.* fail to a miniaturized device for storage and enrichment having a miniaturized separation column downstream thereof. The concept of providing first a device which concentrates and enriches molecules of a gas stream, without separating them, and then directing the concentrated and enriched block of non-separated molecules into a miniaturized separation column in order to then separate the molecules based on their molecular weights is not contemplated in the combination of cited references. Only this concept, as presented in the claimed invention, allows for a proper analysis of gas streams having low concentrations of molecules therein while achieving a good signal-to-noise ratio.

Furthermore, the Action asserts at pages 4-5 that Bailey *et al.* disclose a layer of amorphous carbon and that it would have been obvious to include this in the Bakajin *et al.* device to provide a cover layer or coating as required by Bakajin *et al.* However, the applicants note that the amorphous carbon of Bailey *et al.* is disclosed as "diamond-like carbon films" (column 3, line 30) that are used as an ultraviolet anti-reflective coating. There are other potential uses of these films, like scratch-resistant, UV-inhibiting coatings for lenses or goggles or for forming a deep-UV conventional or

phase-shift mask for a semiconductor device.

However, none of the purposes disclosed in Bailey *et al.* is related to the purpose of the amorphous carbon layer in the subject invention, which is for storage and enrichment of molecules or atoms of a gas stream in a gas chromatograph. In addition, the applicants submit that the advantages disclosed in the Bailey *et al.* for the diamond-like carbon films would not have been relevant for a device as in Bakajin *et al.* and that a skilled artisan would not have had a reason to use the particular carbon film of Bailey *et al.* with the Bakajin *et al.* device. The mere fact that the purported prior art could have been modified or applied in some manner to yield an applicant's invention does not make the modification or application obvious unless "there was an apparent reason to combine the known elements in the fashion claimed" by the applicant. *KSR International Co. v. Teleflex Inc.*, 550 U.S. 550 U.S. 398, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007). Also, an applicant's invention is not "proved obvious merely by demonstrating that each of its elements was, independently, known in the (purported) prior art." *Id.* Here, a valid reason could only be arrived at with the impermissible use of hindsight.

In summary, the combination of cited references fails to teach or suggest the advantageous arrangement in the claimed invention of a miniaturized device for storage and enrichment feeding into a miniaturized separation column. The primary Bakajin *et al.* reference discloses that a microfluidic channel can provide the functions of separation, concentration, and filtering, and one of ordinary skill would not have had a reason to add either a separate enrichment device or separation column. In addition, a skilled artisan would not have had a reason to modify the Bakajin *et al.* device with the carbon film of Bailey *et al.*

Accordingly, the applicants respectfully request reconsideration and withdrawal of the rejection of claims 22-26, 34-36, 38, 39, and 44.

Claims 27-33 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Bakajin *et al.* in view of Bailey *et al.* and in view of Tipler *et al.* as applied to claims 22-26, 34-36, 38, 39, and 44 above, and further in view of Gordon (U.S. Patent No. 5,954,860). The applicants respectfully traverse this ground for rejection because the combination of cited references does not teach or suggest the claimed invention.

The deficiencies of the combination of Bakajin *et al.*, Bailey *et al.*, and Tipler *et al.* have been discussed above. Gordon does not cure these deficiencies. For example, the combination of cited references fails to teach or suggest the advantageous arrangement in the claimed invention of a miniaturized device for storage and enrichment feeding into a miniaturized separation column.

Accordingly, the applicants respectfully request reconsideration and withdrawal of the rejection of claims 27-33.

In view of the foregoing remarks and claim amendments, the applicants believe that the currently pending claims are in condition for allowance, and such action is respectfully requested.

The Commissioner is hereby authorized to charge any fees under 37 CFR §§1.16 or 1.17 as required by this paper to Deposit Account No. 19-0065.

The applicants also invite the Examiner to call the undersigned if clarification is needed on any of this response, or if the Examiner believes a telephone interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,

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